

REMARKS

Claims 1-49 were previously pending in this application. By this amendment, Applicants are canceling claim 31 without prejudice or disclaimer. Claims 1-30 and 32-49 are pending for examination, with claims 1, 12, 21, and 28 being independent claims.

The Office Action rejected claims 1-6, 8-17, and 19-49 under 35 U.S.C. §103(a) as being unpatentable over Starek (5,991,778) in view of Rao (5,920,733). The Office Action rejected claims 7 and 18 under 35 U.S.C. §103(a) as being unpatentable over Starek in view of Rao and further in view of the MS-DOS Del command (MS-DOS User's Reference, Microsoft Corporation, 1987, pg. 56). Applicants respectfully traverse these rejections. As discussed below, the combination of Starek and Rao is improper. In addition, even if one were to combine these references, the combination would fail to disclose or suggest the claimed inventions. Accordingly, withdrawal of these rejections is respectfully requested.

Discussion of the References

Starek is directed to a method and apparatus for real-time secure file deletion. Starek discloses that a vendor supplied driver may be used to intercept file system delete, write, open . (create always) and rename calls and to provide real-time secure file deletion functionality (Col. 5, lines 19-22). In response to intercepting and identifying one of these file system calls, supplemental processing may be performed by the vendor supplied driver (Col. 5, lines 19-26). In response to interception of a delete call to the file system, the vendor supplied driver opens a handle to the file identified in the delete call, requests the size of the file, and overwrites the file with a specified overwrite array (Col. 5, lines 27-32).

Rao is directed to an intelligent peripheral controller which stores and executes some algorithms that are normally executed by a host computer (Col. 1, lines 12-15). In one embodiment, the peripheral device may include one or more utility programs stored in a non-volatile memory which, upon initialization by the host computer, are transferred from the peripheral device to the host computer (Col. 2, lines 4-9). Thus, the peripheral device can be used with many different types of host computers, and is not limited to those pre-configured with the utility programs. In an alternate embodiment, the peripheral device may itself include processing circuitry which executes the utility program (Col. 2, lines 20-27). The utilities

disclosed include compression/decompression algorithms, a conversion algorithm, a disk error correction utility, a utility that maintains a secondary file allocation table or other vital disk information, or an automatic file back-up utility (Col. 2, lines 12-19). The peripheral device may also execute a utility program that performs a formatting of storage media within the peripheral device (Col. 2, lines 28-31).

The Combination of Starek and Rao is Improper

The Office Action asserts that it would have been obvious to one of ordinary skill in the art to off-load the secure delete method described by Starek from the host computer to the intelligent disk drive of Rao to free the host computer to perform other activities. Applicants respectfully disagree.

MPEP §2142 requires that to establish a *prima facie* case of obviousness, there must be a reasonable expectation of success (MPEP §2142, pg. 2100-124, Original Eighth Edition, Rev.1, Feb. 2003). However, the combination of Starek and Rao would not be successful. As discussed above, Starek discloses a vendor-supplied driver executed on the host computer that intercepts file system delete calls and overwrites the file with an overwrite array. If such a vendor-supplied driver were to be executed on the storage device, as suggested by the Office Action, the vendor supplied-driver would not be able to intercept file system calls, such as the delete call, on the host computer. Therefore, the vendor-supplied driver would never write an overwrite array to disk (i.e., perform a secure deletion), as Starek discloses that this is done only in response to intercepting a file system delete call.

Further, the storage device of Rao processes data storage commands using physical storage addresses (i.e., cylinder, head, block). Such a storage device does not understand and cannot operate on logical constructs, such as files, file systems, and logical volumes. Those logical constructs are created and managed on the host. Thus, if the storage device of Rao received a file system command to delete a file, the storage device would be unable to respond, as the disk drive does not include the mapping function on the host that maps the file name to physical disk locations, such that the reference to a file name would be incomprehensible to the disk drive.

To allow the storage device to execute such a command, the mapping capability of the host would also have to be moved to the storage device. This would require a significant increase in the complexity of the disk drive.

In addition, as the Office Action does not suggest that all host functions would be transferred to the disk drive (e.g., executing commands to read or write a file), the mapping utility could not be **moved** from the host to the disk drive, but would need to be **replicated** in the disk drive. This duplication is not only inefficient, but would require continuous communication between the host and the drive to maintain consistent copies of the mapping information in both locations. As an example, when a user opens a new file, the mapping utility on the host would have to assign new blocks and instruct the copy of the mapping utility on the disk drive about the new file. This level of complexity would make all operation of the system inefficient and would more than offset any efficiency gained by performing the specialized secure delete command within the disk drive. Thus, one skilled in the art would not have been motivated to move the mapping capability of the host to the disk drive. Such a wholesale redesign of the system architecture of Starek certainly is not suggested by Rao.

MPEP §2142 also requires that to establish a *prima facie* case of obviousness there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings (MPEP §2142, pg. 2100-124, Original Eighth Edition, Rev.1, Feb. 2003). Applicants do not deny that Rao discloses executing certain utilities on the storage device to reduce the amount of processing required by the host. However, the utility programs disclosed by Rao for execution on the storage device are disk utilities (i.e., format conversion, disk formatting, compression, disk error correction). Nowhere does Rao disclose or suggest executing a driver that intercepts file system commands on the storage device, nor does Rao disclose or suggest moving the capability to map logical objects to physical addresses from the host computer to the storage device.

For the reasons discussed above, the combination of Starek and Rao is improper. Accordingly, it is respectfully requested that the rejection of claims 1-49 under 35 U.S.C. §103(a) be withdrawn.

The Claims Patentably Distinguish Over the Combination

Assuming, *arguendo*, that the combination of Starek and Rao were proper, Applicants' claims still patentably distinguish over the combination.

Claim 1

Claim 1 is directed to a storage system for use in a computer system including a host computer. The storage system comprises at least one storage device having a plurality of user-accessible storage locations, the at least one storage device including at least one disk drive; a cache memory; and a controller, coupled to the cache memory and the at least one storage device, that controls access to the at least one storage device from the host computer, the controller being capable of generating data that is independent of any data passed from the host computer to the storage system and writing the generated data to at least two non-contiguous user-accessible storage locations on the at least one storage device in response to a communication from the host computer that does not include the generated data to be written to the at least two non-contiguous user-accessible storage locations, without writing the generated data to at least one user-accessible storage location disposed between the at least two non-contiguous storage locations so that any data in the at least one user-accessible storage location is preserved.

Neither Starek nor Rao, taken alone or in combination, discloses or suggests "writing the generated data to at least two non-contiguous user-accessible storage locations on the at least one storage device in response to a communication from the host computer." Starek merely discloses overwriting a file. Nowhere does Starek disclose or suggest that the file is stored in at least two non-contiguous locations. While the Office Action asserts that it would have been obvious to one of skill in the art "that the files were fragmented in the environment described by the combination," there is no basis in either Starek and Rao for such an assertion. In addition, the manner in which a file with blocks stored in non-contiguous locations is typically overwritten is with the use of a plurality of different write commands issued to the drive, with each write command writing data to only contiguous locations. Starek certainly does not disclose or suggest the use of a single command that writes data to two or more non-

contiguous locations. Applicants traverse any assertion that prior art exists that would suggest the writing to two or more non-contiguous locations based on a single command.

It should be understood that claim 1 does not require writing all of the generated data in response to a single communication from the host, as claim 1 contemplates a situation where multiple communications (i.e., any number) may be used to write the generated data, with only one of those commands relating to data written to at least two non-contiguous storage locations.

Therefore, claim 1 patentably distinguishes over the combination of Starek and Rao. Accordingly, it is respectfully requested that the rejection of claim 1 under 35 U.S.C. §103(a) be withdrawn.

Claims 2-11 and 22-24 depend from claim 1 and are patentable for at least the reasons discussed above with respect to claim 1. Accordingly, it is respectfully requested that the rejection of claims 2-11 and 22-24 under 35 U.S.C. §103(a) be withdrawn.

Claim 12

Claim 12 is directed to a method of operating a storage system in a computer system including the storage system and a host computer coupled thereto, wherein the storage system includes a cache memory and at least one storage device having a plurality of user-accessible storage locations, the at least one storage device including at least one disk drive. The method comprises, in response to a communication received from the host computer, acts of: (A) generating, within the storage system, data that is independent of any data passed from the host computer to the storage system to be written to at least two non-contiguous user-accessible storage locations of the plurality of user-accessible storage locations on the at least one storage device; and (B) writing the generated data to the at least two non-contiguous user-accessible storage locations without writing the generated data to at least one user-accessible storage location disposed between the at least two non-contiguous storage locations so that any data in the at least one user-accessible storage location is preserved.

Neither Starek nor Rao, taken alone or in combination, discloses or suggests “writing the generated data to the at least two non-contiguous user-accessible storage locations.” As

discussed above with respect to claim 1, Starek merely discloses overwriting a file and does not disclose or suggest that the file is stored in at least two non-contiguous locations in response to a communication from the host. As discussed above, the manner in which a file stored in non-contiguous locations is typically overwritten would be with a plurality of different write commands issued to the drive, with each write command specifying only contiguous locations. Nowhere does Starek suggest that data is written to disk in any other manner.

Rao also fails to disclose or suggest writing data to two non-contiguous user-accessible locations, as the format utility of Rao does not write data to user-accessible storage locations.

Therefore, claim 12 patentably distinguishes over the combination of Starek and Rao. Accordingly, it is respectfully requested that the rejection of claim 12 under 35 U.S.C. §103(a) be withdrawn.

Claims 13-20, 25, and 26 depend from claim 12 and are patentable for at least the reasons discussed above with respect to claim 12. Accordingly, it is respectfully requested that the rejection of claims 13-20, 25, and 26 under 35 U.S.C. §103(a) be withdrawn.

Claim 21

Claim 21 is directed to a method of writing information to a logical object of the host computer in a computer system including a storage system and a host computer coupled thereto, the storage system including a cache memory and at least one storage device. The method comprises, in response to a communication received from the host computer, acts of: (A) generating, within the storage system, data that is independent of any data passed from the host computer to the storage system to be written to a plurality of storage locations on the at least one storage device corresponding to the logical object of the host computer; and (B) writing the generated data to only the plurality of storage locations corresponding to the logical object.

Neither Starek nor Rao, taken alone or in combination discloses or suggests “generating, within the storage system, data that is independent of any data passed from the host computer to the storage system to be written to a plurality of storage locations on the at

least one storage device corresponding to the logical object of the host computer” and “writing the generated data to only the plurality of storage locations corresponding to the logical object.” To the extent the Office Action suggests that Rao teaches that the disk drive would generate and write the data in the combined system, the disk drive of Rao has no understanding of the logical relationship of the data received, as the drive simply does not understand which storage locations correspond to a given logical object and which do not.

In view of the foregoing, claim 21 patentably distinguishes over the combination of Starek and Rao. Accordingly, it is respectfully requested that the rejection of claim 21 under 35 U.S.C. §103(a) be withdrawn.

Claim 27 depends from claim 21 and is patentable for at least the reasons discussed above with respect to claim 21. Accordingly, it is respectfully requested that the rejection of claim 27 under 35 U.S.C. §103(a) be withdrawn.

Claim 28

Claim 28 is directed to a method of writing information to a logical object of the host computer in a computer system including a storage system and a host computer coupled thereto, the storage system including at least one storage device having a plurality of storage locations. The method comprises acts of: mapping the logical object to at least one storage location of the plurality of storage locations on the at least one storage device that is assigned to store the information for the logical object; receiving, at the storage system, a communication from the host computer identifying the at least one storage location; and generating, within the storage system, data that is independent of any data passed from the host computer to the storage system and writing the generated data to the at least one storage location in response to the act of receiving the communication.

Neither Starek nor Rao, taken alone or in combination, discloses or suggests “mapping the logical object to at least one storage location of the plurality of storage locations on the at least one storage device that is assigned to store the information for the logical object” and “receiving, at the storage system, a communication from the host computer identifying the at least one storage location.”

As discussed above, if one were to combine Starek and Rao in the manner suggested in the Office Action, it would be necessary to perform the mapping of a file to physical disk locations on the storage device. That is, the storage device would have to be able to map logical constructs, such as files, to physical disk locations. Thus, the storage device of Rao would not receive a communication from the host computer that identifies the physical location(s) assigned to store information for the logical object, as the storage device would be receiving a command that would only identify the logical object, and the disk drive would be performing for itself the mapping that identifies the corresponding physical storage locations.

In view of the foregoing, claim 28 patentably distinguishes over the combination of Starek and Rao. Accordingly, it is respectfully requested that the rejection of claim 28 under 35 U.S.C. §103(a) be withdrawn.

Claims 29, 30, and 32-49 depend from claim 28 and are patentable for at least the reasons discussed above with respect to claim 28. Accordingly, it is respectfully requested that the rejection of claims 29, 30, and 32-49 under 35 U.S.C. §103(a) be withdrawn.

CONCLUSION

In view of the foregoing amendments and remarks, this application should now be in condition for allowance. A notice to this effect is respectfully requested. If the Examiner believes, after this amendment, that the application is not in condition for allowance, the Examiner is requested to call the Applicants' attorney at the telephone number listed below.

If this response is not considered timely filed and if a request for an extension of time is otherwise absent, Applicants hereby request any necessary extension of time. If there is a fee occasioned by this response, including an extension fee, that is not covered by an enclosed check, please charge any deficiency to Deposit Account No. 23/2825.

Respectfully submitted,

Steven M. Blumenau, et al., Applicants

By: Richard F. Giunta
Richard F. Giunta, Reg. No. 36,149
Wolf, Greenfield & Sacks, P.C.
600 Atlantic Avenue
Boston, Massachusetts 02210-2211
Telephone: (617) 720-3500

Docket No. E00295.70040

Date: July 30, 2003
x07/30/03x